qualifier from the diagnostic information.

[0030] Based on the analysis of the diagnostic information, a generator module 140 generates a data condition of the diagnostic information. A selector module 145 then uses the data condition to select a data manipulation process. Once the selector module 145 has selected a data manipulation process, a data manipulator module 150 manipulates the asynchronous component and the synchronous component according to the data manipulation process selection.

[0031] Referring to Fig. 2, a flow chart of a method of selecting a physiological data manipulation process 200 according to the invention includes a receiving step 210 to receive raw ECG data by from the ECG monitoring device. The raw ECG data is subsequently analyzed in the analysis module, by programs such as the 12SL brand ECG analysis software available from General Electric Co. Medical Systems Division, in an analyzing step 215 to generate a plurality of diagnostic interpretation statements to indicate a cardiac condition. The analyzing step 215 also generates a set of global measurements using the entire set of ECG leads. The measurements include a ventricular rate, an atrial rate, a PR interval, a QRS duration, a P duration, a QT interval and a set of axis of a P wave, a QRS wave and a T wave. The analyzing step 215 further generates a set of individual lead measurements including a set of amplitudes and durations of various ECG features such as P waves, Q waves, R waves, S waves, and ST levels. In addition, the analyzing step 215 also automatically generates an ECG signal quality indicator which indicates the noise level of the ECG. Furthermore, the analyzing step 215 generates a set of classification statements to indicate that an ECG is normal, borderline abnormal, or abnormal, and generates a patient information profile including the age and other relevant characteristics of the patient. However, it should be readily apparent to those of ordinary skill in the art that the analysis program can generate a different number of statements, parameters and features, and that the analysis program is not restricted to 12SL brand ECG analysis software as described herein.

[0032] Referring again to Fig. 2, the ECG data is separated into an asynchronous component in a first separating step 220, and a synchronous component in a second separating step 225. A first-difference of the synchronous component is found in a first comparing step 230. The first-difference is then Huffman encoded in an encoding step 235 to obtain

lossless compressed data.

[0033] The asynchronous component obtained in the first separating step 220 is subjected to a lossy compression if it satisfies all the normal conditions. A first condition is checked at step 240. The first condition is a sinus rhythm with a 1:1 atrio-ventricular conduction and no rhythm qualifiers including normal sinus rhythm, sinus tachycardia, sinus bradycardia, and marked sinus bradycardia, and possibly rhythms with sinus or marked sinus arrhythmia, a second condition is checked at step 245. Otherwise, the asynchronous component will be subjected to a lossless compression starting in the first comparing step 230.

[0034] The second condition is a count of the ventricular rate (VRATE). If the ventricular rate is higher than 120 beats per minute (bpm), the asynchronous component will be subjected to a lossless compression starting in the first comparing step 230. If the ventricular rate falls between low to moderate, that is, less than 120 bpm, a third condition is checked at step 250.

[0035] The third condition is the presence of a P wave amplitude greater than 100 μ V in all recorded leads. If the presence of a P wave amplitude greater than 100 μ V in all recorded leads is not identified, the asynchronous component will be subjected to a lossless compression starting in the first comparing step 230. Otherwise, a fourth condition is checked at 255.

[0036] The fourth condition is the presence of a normal QT interval. If a normal QT interval is not present, the asynchronous component will be subjected to a lossless compression starting in the first comparing step 230. Otherwise, a fifth condition is checked in 260.

[0037] The fifth condition is a patient age. If the patient age is not greater than 15 (a preferred pediatric age limit), the asynchronous component will be subjected to a lossless compression starting in the first comparing step 230. Otherwise, the asynchronous component will be subjected to a lossy compression starting in a filtering step 265.

[0038] A moving average filter of uniform weights is used to filter the asynchronous components in the filtering step 265 to produce filtered data. The length of the moving average filter is chosen to be two or four, equaling a factor of down-sampling which

depends on a down-sampling rate used in step 270. For example, the length is two if the factor of down-sampling is two, that is, the sampling rate goes from the original effective rate of 500 samples per second (sps) down to a lowered effective rate of 250 sps. The length is four if the factor of down-sampling is 4, that is, the sampling rate goes from the original effective rate of 500 sps to a lowered effective rate of 125 sps. Specifically, bimodal decimation is used in the filtering step 265 and step 270. More specifically, the asynchronous data is filtered and down-sampled selectively in time segments outside the QRS duration, while the intra-QRS region is retained at the original rate, for example, 500 sps. However, it should be readily apparent to those of ordinary skill in the art that the type of filter, and the factor of down-sampling or the decimation mode may be different than is described here due to different compatibility issues. The filtered data is then down-sampled in step 270 to produce down-sampled data.

[0039] The down-sampled data is then requantized in a quantizing step 275 to produce requantized data. A requantization reduces a resolution of the down-sampled data to a lower resolution by dropping the least significant bit (LSB) of the down-sampled data. After the requantization, the requantized data is first-differenced in a second comparing step 280 to obtain a first-differenced data. In first-differencing, a first data sample is saved, all subsequent data samples are subtracted from an adjacent data sample to yield the first-differenced data. Thereafter, the first-differenced data is encoded in a polarity reversal encoding step 285 to produce a residual signal. (When there are polarity reversals in two adjacent data samples, both of these data sample values are reduced by one least significant bit.) The residual signal is then Huffman encoded in an encoding step 235 to obtain lossy compressed data.

[0040] Various features and advantages of the invention are set forth in the following claims.